

Seasonal food habits of coyotes, *Canis latrans*, in the Bolsón de Mapimí, Southern Chihuahuan Desert, Mexico

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Receipt of Ms. 01. 03. 1993

Acceptance of Ms. 16. 09. 1993

Abstract

Studied the seasonal foods of coyotes, *Canis latrans*, at the Biosphere Reserve of Mapimí in the Southern Chihuahuan Desert, Mexico, by analysis of 508 faeces (scats) collected between March 1985 and November 1986. Lagomorphs were the most frequent food, occurring in 49% of the samples, followed by fruits (33%) and rodents (32%). There were important seasonal and interannual changes in food habits. As a rule, lagomorphs were the most frequent item in autumn and winter, but fruits (mainly *Opuntia* sp.) predominated in summer and rodents (mainly *Neotoma albigula*) in spring. Birds and reptiles were consumed to a low proportion and ungulates were eaten only when carcasses were available. Our data suggest that the coyote in this area behaves as a selective predator of rabbits, occasionally using abundant alternative foods in an opportunistic way.

Introduction

The ecology of coyotes *Canis latrans* is among the best known of all carnivores (BEKOFF 1982). However, most investigations have been carried on in the United States and Canada. Thus, information about the food habits of coyotes in the southern region of its range is rather scarce. Studies on coyotes' diet in Mexico have been conducted at cattle ranches of Chihuahua, where the main food was carrion (PÉREZ GUTIÉRREZ et al. 1982) and vegetables (VELA 1985), and in pineoak forests of the Sierra Madre Occidental, where the spring-summer staple prey were rodents, arthropods and berries (DELIBES et al. 1989). In addition, most ecological research on coyotes has been conducted in agricultural regions, where this species is usually considered as a pest (VOIGT and BERG 1987). Thus, studies in desert areas are lacking. In a previous investigation, HERNÁNDEZ et al. (1993) reported on the autumn food habits of coyotes in some areas of the deserts of Sonora and Chihuahua. The aim of this study is to report on seasonal food habits of this species in the Mapimí Biosphere Reserve of the Southern Chihuahuan desert.

Study area

The study was made in the surroundings of the field laboratory of the Mapimí Biosphere Reserve, located in the Mapimí Bolsón area, close to the vertex formed by the Mexican states of Chihuahua, Coahuila and Durango (ca. 26°40' N, 103°45' W). The area is a flat plain (average altitude 1100 m above sea level) with poor drainage. Vegetation is low and scattered, dominated by creosote bush (*Larrea tridentata*), mesquite (*Prosopis glandulosa*), prickly-pear (*Opuntia* sp.) and agave (*Agave* sp.). A recent vegetation map of the area has been published by MONTAÑA (1988). Climate is semiarid, with irregular summer rains (263 mm per year on average) and mean monthly temperatures ranging from 12°C in January to 28°C in June and July (CORNET 1988).

Material and methods

By walking along a stretch of dirt roads of approximately 10 km in the reserve every month, from March 1985 to November 1986, we collected a total of 508 coyote faeces. Faeces (scats) were identified by size, scent and the nearby presence of coyote tracks. We used hairs, teeth, bones, feathers, scales, any other hard structures, and seeds to identify prey species by comparison with a reference collection. We were unable to differentiate the remains of black-tailed jackrabbits (*Lepus californicus*) from those of desert cottontails (*Sylvilagus auduboni*). Number of occurrences and percent frequency of occurrence (number of occurrences \times 100/number of scats) were obtained for each food species or group. These data did not accurately reflect the weight of ingested material, but they are usually considered to yield a good representation of food habits (e.g., NIEBAUER and RONGSTAD 1977).

Monthly samples were grouped into four seasons: spring (March to May), summer (June to August), autumn (September to November), and winter (December to January). Seasonal differences in the occurrence of particular items were determined by contingency-table analysis (G-test) (SOKAL and ROHLF 1981).

Results

Lagomorphs were the most frequently occurring food item, followed by fruit and rodents. Ungulates, birds, reptiles, arthropods and garbage (plastic material) were only rarely ingested (Tab. 1).

By pooling data corresponding to seasons from 1985 and 1986, it was found that lagomorphs were the most frequent item in autumn (45.3 % of occurrences) and winter (57.3 %), while they occupied a second place in spring (34.1 %) and summer (28.5 %). However, interannual differences were significant (Table). Seasonal frequency of occurrence of lagomorphs was not related to estimations of lagomorph abundance in the field.

Fruits were the most frequent item in the scats collected in summer (50.3 % of occurrences), but ranged on third place in spring (18.4 %), autumn (16.1 %), and winter (12.9 %). Prickly-pear was the most commonly consumed fruit, followed by mesquite. Both were eaten in high proportions in summer, when they were ripe. Turk head (*Hamatocactus hamattocanthus*) fruit was consumed in winter, while lotebush (*Ziziphus obtusifolia*) was frequent in summer (1985) and spring (1986) (the fructification of this shrub shows a considerable plasticity in response to autumn precipitation; FOSTER et al. 1984). Althorn (*Castella texana*) fruit was consumed during the first spring.

Rodents were the most frequent item in the scats collected in spring (35.7 %), and they occupied a second place in autumn (32.8 %) as well as in winter (21 %), and the third place in summer (13.5 %). Woodrats (*Neotoma albigula*) were the most commonly consumed rodents, especially in spring (1985), followed by kangaroo rats (*Dipodomys* sp.), deer mice (*Peromyscus* sp.) and pocket mice (*Perognathus* sp.). Ground squirrels (*Spermophilus spilosoma* and *Spermophilus mexicana*) primarily appeared during the first autumn.

Birds and reptiles were consumed to a low proportion, and there were no seasonal trends in their utilization (Table). Arthropods (mainly beetles and grasshoppers) were consumed especially in spring and summer. Carcasses of calves were eaten during the second spring, when there was a high mortality of cattle caused by disease. Remains of mule deer (*Odocoileus hemionus*) appeared in the faeces mainly in winter, at the same time when we observed some coyotes feeding upon two carcasses of deer killed by mountain lions (*Felis concolor*).

Discussion

Our data suggest that lagomorphs were the staple prey for coyotes in Mapimí, as it occurs in other areas (SHORT 1979). Nevertheless, a seasonally high availability of alternative prey (mainly prickly-pears in summer) will produce a change to these temporally abundant foods, even when leporids are present at a high level of population size (e.g., in summer 1986). As found by other authors (MURIE 1945; JOHNSON and HANSEN 1977, 1979), it

Occurrences of different foods in the faeces of coyotes

Season N	SP85 (68)	SM85 (77)	AT85 (64)	WT85 (101)	SP86 (75)	SM86 (70)	AT86 (53)	Total (508)	FO	G Values
Ungulates										
<i>Bos taurus</i>	1	0	2	0	6	0	0	9	1.7	19.4**
<i>Odocoileus hemionus</i>	0	1	0	4	0	0	0	5	0.9	11.7 ns
Lagomorphs	34	36	29	71	29	19	33	251	49.4	24.2***
Rodents										
<i>Neotoma albigula</i>	18	13	5	14	13	3	11	77	15.1	16.5*
<i>Dipodomys</i> sp.	8	2	7	9	11	4	3	44	8.6	9.8 ns
<i>Spermophilus</i> sp.	0	0	4	1	1	0	0	6	1.1	13.5*
<i>Perognathus</i> sp.	3	1	2	2	0	0	6	14	2.7	18.7**
<i>Peromyscus</i> sp.	1	0	6	0	8	0	0	15	2.9	32.6***
Unidentified	2	3	0	0	1	0	1	7	1.3	9.4 ns
Birds	1	0	1	4	4	1	2	13	2.5	7.8 ns
Reptiles	3	0	1	0	1	2	1	8	1.5	8.8 ns
Arthropods	4	2	0	1	2	9	0	18	3.5	21.9**
Fruit										
<i>Prosopis glandulosa</i>	0	7	4	2	1	10	0	24	4.7	26.8***
<i>Opuntia</i> sp.	0	30	10	2	6	34	4	86	16.9	92.3***
<i>Hamatocactus hamatocanthus</i>	1	0	0	9	1	0	0	11	2.1	24.0***
<i>Ziziphus obtusifolia</i>	3	8	0	0	10	2	0	23	4.5	30.3***
<i>Castella texana</i>	4	1	1	0	0	0	0	6	1.1	13.6*
<i>Castella texana</i>	1	1	3	3	7	4	0	19	3.7	11.5 ns
Other vegetables	0	0	1	2	0	0	0	3	0.5	6.9 ns

SP = Spring; SM = Summer; AT = Autumn; WT = Winter; 85 = year 1985; 86 = year 1986; N = Number of faeces analysed in each season; FO = total frequency of occurrence (sum of occurrences of each item \times 100 number of faeces). G test indicates differences between periods in the proportion of prey consumed. *** = $P < 0.001$; ** = $P < 0.01$; * = $P < 0.05$; ns = not significant.

appears that coyotes seek lagomorphs or some other abundant food and make it their basic prey throughout the year. This fact suggests that they are selective rather than opportunistic feeders. The high occurrence of leporids in the diet during the winter of 1985, when being relatively scarce in the study area, supports this statement. Conversely, changes in the abundance of alternative prey were paralleled by seasonal variations in the frequency of occurrence of these foods in samples, as noted for rodents in a similar area in Texas (WINDBERG 1985). This foraging behaviour (a selective predator occasionally using abundant alternative foods in an opportunistic way) is similar to that reported for the European badger (*Meles meles*) by KRUK and PARISH (1981).

Prickly-pears and woodrats were important buffer prey for coyotes in Mapimi. We found that two radiotracked coyotes in the area showed a strong preference for a structurally heterogeneous habitat with dominance of mesquite, creosote bush, galleta grass (*Hilaria mutica*) and prickly-pear, where woodrats (feeding on prickly-pears) were especially abundant (GRENOT and SERRANO 1981). This habitat type is relatively rare in the Reserve, but it seems to be preferred by coyotes, probably because of the abundance of these foods.

Our results differ from those of PEREZ-GUTIERREZ et al. (1982) probably due to the high cattle raising activity in their study areas. They found carrion as the main food item for coyotes, followed by lagomorphs and rodents. VELA (1985) obtained results similar to the present data in one of three areas that she studied, vegetables being the main item (followed by lagomorphs) in the other two.

In conclusion, lagomorphs are an important food for coyotes in the arid zones of north-central Mexico, their relative role in the diet changing according to the abundance of buffer foods. In areas such as the Mapimí Biosphere Reserve, where exploitation is very low, lagomorphs are the basic prey of coyotes, and changes in the density of this predator can probably be expected to follow changes in leporid abundance (CLARK 1972; TODD et al. 1981). The effects of coyotes on large wild and domestic ungulates in these areas seem to be scarce, their consumption being probably related to cattle diseases and mountain lion predation on deer.

Acknowledgements

This research was supported by the Instituto de Ecología within the project "Mapimí" and by an agreement between the Mexican CONACYT and the Spanish CSIC. We gratefully acknowledge the field assistance of A. L. HERRERA, A. HERRERA and F. HERRERA. R. RUIZ DE ESPARZA helped in the identification of seeds and F. PIZARRO in the preparation of hair slides. Dr. E. EZCURRA provided helpful suggestions for improvement of the manuscript. N. BUSTAMANTE revised the English and C. KELLER prepared the German summary.

Zusammenfassung

Jahreszeitliche Ernährungsgewohnheiten von Kojoten, Canis latrans, im Bolsón- de Mapimí-Reservat, südliche Chihuahua-Wüste, Mexiko

Die Ernährung von Kojoten, *Canis latrans*, wurde im Biosphäre-Reservat Mapimí in der südlichen Chihuahua-Wüste untersucht anhand der Analyse von 508 Kotproben, die zwischen März 1985 und November 1986 monatlich eingesammelt wurden. Lagomorpha kamen häufiger vor und wurden in 49% der Proben gefunden. Es folgten Früchte (33%) und Nagetiere (32%). Wichtige intra- und interannuale Änderungen in den Ernährungsgewohnheiten wurden festgestellt. Normalerweise stellen Lagomorpha den Hauptanteil der Nahrung im Herbst und Winter, während Früchte (hauptsächlich *Opuntia* sp.) im Sommer, und Nagetiere (vorwiegend *Neotoma albigula*) im Frühling gefressen wurden. Vögel und Reptilien bildeten nur einen geringen Anteil der Nahrung, und Ungulaten wurden nur als Aas gefressen. Unsere Daten lassen vermuten, daß Kojoten in diesem Gebiet eine selektive Bevorzugung von Kaninchen zeigen, sich aber auch in opportunistischer Weise von zahlreichen anderen Tieren und Pflanzen ernähren.

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